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Sample assessment material

LEVEL 3 ALTERNATIVE ACADEMIC QUALIFICATION CAMBRIDGE ADVANCED NATIONAL IN

APPLIED SCIENCE

Extended Certificate H151

For first teaching in 2025

F181: Science in society

Version 2.0 (May 2025)

Introduction

This is Sample Assessment Material (SAM) which has been produced for the OCR Level 3 Alternative Academic Qualification Cambridge Advanced National in Applied Science (Extended Certificate).

The SAM is an example exam paper that we publish alongside a new specification to help illustrate its intended style and structure when a qualification is first launched. We wanted to share the story of our assessment approach with you so when you look through the paper you will find we have pointed out certain features and explained the decisions we have made.

Resources to help support in teaching different areas of content can be found on the Cambridge Advanced National Applied Science webpage under 'Planning and teaching'.

Our exam papers are developed with our accessibility principles in mind. The Understanding the assessment guide tells you a little more about the principles and rationale underpinning our approach for the qualifications. The 'Command Words' are in both the Understanding the Assessment guide and the specification. These tell you what we mean by each command word and how students should approach the question and understand its demand.

Appendix B of the specification: **Command Words**, gives detail about what is expected of each command word that will be included in exams and mark schemes. You can include teaching around the expectations of these as part of your teaching.

You said, we did

During the development of this qualification, we talked extensively with teachers, subject experts, higher education institutions and our senior assessment teams to influence the structure, content and assessment materials. We then shared our final materials with teachers to make sure that they met their needs.

You told us that it was important to link all three sciences within our course and that you wanted mandatory units that covered the core knowledge for the course so that is what we have done through units F180 and F182.

You told us that you wanted optionality within the NEA units and a range of engaging optional units to choose from, so that is what we have provided.

You told us that knowledge areas such as cell structure and function, atomic structure, rates of reaction and forces were important parts of the subject. Some of these areas are also currently assessed in the EA in the OCR Level 3 Cambridge Technical in Applied Science and this has proven to be a valid and reliable approach so we've carried it over to this new qualification.

You told us that the order in which the units and concepts occur within our units needs to be considered carefully, with a rationale behind it. We have done this through clearly structured specification units linked to corresponding exam sections.

You told us that it was very important that knowledge and scientific concepts be assessed in a way that clearly links to real-life contexts and scenarios that students can easily engage with. We have done this by using clearly described scenarios with accessible language within our questioning.

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All students will sit the exam at the same time on the same day.

This exam will always be set and marked by us. Exams will be available in January and June each year. Students can resit this unit and the best result will be used to calculate the certification result.

Students will be provided with a clean hard copy of the pre-release material which will exist within an insert booklet. This will support them to complete the questions in the paper. Students are expected to become familiar with this material prior to the assessment.

Students can use a scientific or graphical calculator and a ruler (that measures cm and mm) in this exam.

If students require additional answer space, lined paper will be available at the end of the answer booklet in a live question paper. Remember the question number(s) must be clearly shown.

OCR
Oxford Cambridge and RSA

<<Date>> – <<Morning/Afternoon>>

Level 3 Cambridge Advanced National (AAQ) in Applied Science (Extended Certificate)

This unit is part of the Extended Certificate qualification only.

H151 Unit F181: Science in society

Sample Assessment Material (SAM)

Time allowed: 1 hour 15 minutes
XXX/XXXX

The time allowed is designed to give students approximately one minute per mark plus reading time.

You must have:
- the Insert (inserted)

You can use:
- a scientific or graphical calculator
- a ruler (cm/mm)

Please write clearly in black ink. **Do not write in the barcodes.**

Centre number | Candidate number

First name(s)

Last name

Date of birth D D M M Y Y Y Y

INSTRUCTIONS
- Use black ink.
- Write your answer to each question in the space provided. You can use extra paper if you need to, but you must clearly show your candidate number, the centre number and the question numbers.
- In the live exam there might be lined pages at the end of the question paper for you to use if you need extra space. Remember, you must clearly show the question numbers.
- Answer **all** the questions.

This paper has no optional questions.

INFORMATION
- The total mark for this paper is **50**.
- The marks for each question are shown in brackets **[ ]**
- This document consists of **12** pages.

The exam will always have 50 marks.

ADVICE
- Read each question carefully before you start your answer.

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All questions in this exam are mandatory. A range of question types are used, including:

- Forced choice/controlled response questions (also known as multiple choice questions (MCQs)). These are typically 1 mark but may have a maximum of 4 marks for a single MCQ.
- Short answer closed response questions. These questions sometimes might involve diagrams or calculations. They are typically worth 1 to 4 marks.
- Extended constructed response questions with points-based mark schemes
- Extended constructed response questions with levels of response mark schemes. There will always be one 6-mark question and one 9-mark question.

These question types allow us to assess the following Performance Objectives:

- PO1 – Show knowledge and understanding
- PO2 – Apply knowledge and understanding
- PO3 – Analyse and evaluate knowledge, understanding and performance.

The questions will sample content from across all Topic Areas; at least one question (or sub-part) will relate to each Topic Area. Sub-content topic areas will be sampled across exam papers, over time.

Answer **all** the questions

Section A (Pre-release based section)

1 When scientists make new discoveries, a process called peer review takes place.

The scientist submits a written report about the new discovery to an editor.

The editor sends the report to a peer reviewer.

(a)

(i) State **two** reasons why the peer review process is important.

1 .....

.....

2 .....

..... **[2]**

(ii) In **Source A**, Thomas Loerting would be a suitable person to be a peer reviewer for the report about the new ice.

Give **two** reasons why.

1 .....

.....

2 .....

..... **[2]**

(b) Scientists often work together in an international community of scientists.

(i) Give **one** piece of evidence in **Source A** which shows an international community of scientists.

.....

..... **[1]**

(ii) State **two** reasons why an international community of scientists working together is important in new discoveries.

1 .....

2 ..... **[2]**

(c) Describe the role of the computational physicist in the investigation in **Source A**.

.....

..... **[1]**

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Section A of the exam will be the pre-release based section of the exam. Section A will be worth between 23-27 marks.

In Unit F181 Science in society, there will be between 15-25 PO2 (apply knowledge and understanding) marks. This proportion of PO2 marks, together with the 15 PO3 marks, helps to ensure that there is a clear applied focus to the assessment of the content in this unit. PO2 is assessed in question 1(b)(i), for example, by requiring students to evidence from Source A that there is an international community of scientists.

The number of discrete points needed will always be written as a word in bold.

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In this exam there will be between 10-20 PO1 (show knowledge and understanding) marks. PO1 marks allow for knowledge and understanding to be assessed out of context in this assessment. PO1 is assessed in question 2(a), for example, by requiring students to define what a scientific law is.

2

(a) The new ice in **Source A** and **Source B** is a non-crystalline solid which does not obey the Third Law of Thermodynamics.

What is a scientific law?

.....

..... **[1]**

(b) Describe how a scientific theory is different to a scientific law.

.....

..... **[1]**

(c) **Source B** describes how scientists examined the new ice with X-rays to understand it.

What conclusion did the scientists make about the new ice from the X-ray analysis?

.....

..... **[1]**

The number of lines given for a question indicate the approximate length of the answer required.

(d) **Source B** contains a section at the end which is subtitled 'Ice cold fact file'.

Identify **two** reasons why the author of **Source B** has included this section in the article.

Where a question asks for a specific number of points, we will always put numbers or response headings against the answer lines to show where students should write each point of their response.

1 .....

.....

2 .....

..... **[2]**

The number of marks for a question will always be given at the end of the question and will always be right aligned.

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This is an example of an extended constructed response question with a points-based mark scheme.

We will use this question type to assess PO1 and PO2. This will enable students to show or apply knowledge and understanding.

Question 3(b) provides opportunities for students to demonstrate their scientific literacy skills and also provides an example of where self-directed learning around the pre-release material would prove to be particularly helpful.

3 Scientists in **Source B** have a hypothesis that the new ice may exist inside the icy moons of planets like Jupiter.

(a) Give **one** piece of evidence from **Source B** which supports the scientists' hypothesis.

.....

..... **[1]**

(b) Further scientific development might involve collecting samples of the ice on the moons of Jupiter. This might enable scientists to test their hypothesis.

Outline **two implications or limitations** of this further scientific development and how these might be overcome.

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..... **[4]**

This question is structured into two parts, with the first 2 marks being for an outline of two implications or limitations, and the second set of 2 marks being for how these implications/limitations might be overcome.

The focus we want students to have is on the two implications or limitations and so that is why these terms have been emboldened.

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Question 4 is an example of a 9 mark discuss extended constructed response question with a levels-of-response mark scheme. It will assess a student's ability to present, analyse and evaluate relevant points (for example, for/against an argument to make a reasoned judgment).

Extended response questions with a level-of-response mark scheme give students an opportunity to show examiners the extent of their knowledge and understanding of the subject.

The number of lines given for a question indicate the approximate length of the answer required.

4 You have been asked to recommend some scientific articles for sixth form science students.

The articles should be:

- valid
- effective at providing accurate information
- engaging for the students.

Discuss whether **Source A** and **Source B** would be appropriate articles for the student. In your answer you **must** write about:

- The ways that **Source A** and **Source B** are appropriate articles for the students.
- The ways that **Source A** and **Source B** are not appropriate articles for the students.
- Whether you would recommend **Source A** and **Source B** to the students **and** your reasons.

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..... **[9]**

PO3 (analyse and evaluate knowledge, understanding and performance) will always be assessed by two levels of response questions. The command words used will be discuss or analyse. These questions can appear anywhere within the question paper. The questions' topic may be drawn from any relevant aspect of the unit teaching content.

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When we ask a forced choice controlled response question, e.g. an **order of the steps** question, we will use letters to label the steps. Students choose their answer(s) and write the letter in the space given. There is one mark for getting the correct sequence of letters before the letter 'E' which has already been provided, and one mark for getting the correct sequence after the letter 'E'.

Section B (Non pre-release)

Section B will not be based on the pre-release. Section B will be worth between 23-27 marks.

5 Battery technology in electric cars has developed from scientists using the scientific method to conduct research.

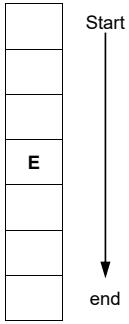
(a) The table shows the seven steps of the Scientific Method.

The steps are **not** in the correct order.

	Action
A	Formulating a hypothesis and making predictions
B	Drawing conclusions
C	Defining the problem
D	Communicating results to others
E	Performing experiments
F	Research
G	Analysing data

Write the letters in the boxes to show the **correct** order of the steps.

One has been done for you.



[2]

(b) What is the difference between a hypothesis and a prediction?

PO1 questions will be interspersed throughout the question paper showing the importance of core knowledge and understanding.

.....

..... **[1]**

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5(d) is an example of a PO2 question that is assessing students' ability to apply their knowledge and understanding of the implications and limitations of scientific developments. A detailed context has been provided, but only includes information that could be deemed helpful to answer the question.

(c) The scientific method is a non-linear process.

Explain this statement.

.....

.....

.....

..... **[2]**

(d) Mining the various metals needed for lithium-ion batteries requires vast resources. 2 273 000 litres of water is required to mine one tonne of Lithium. Pure lithium metal is then extracted by electrolysis.

An environmental analysis of lithium mining in a country in South America has been linked to destruction of habitats, and increased levels of drought in nature reserves. This analysis also shows that it costs more to recycle lithium-ion batteries than to mine for more lithium and make new ones. Approximately 5% of lithium-ion batteries are recycled globally, with the rest going to landfill.

Explain why it is important for scientists to continue to develop battery technology.

.....

.....

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..... **[3]**

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6 The table shows data on the total number of new cars sold and number of new electric cars sold in the UK between 2018 and 2022.

Year	Total number of new cars sold in the UK	Number of new electric cars sold in the UK	Percentage of new cars sold in UK that were electric cars (%)
2018	2 370 000	15 500	0.00654%
2019	2 310 000	37 900	0.0164%
2020	1 630 000	108 200	6.64%
2021	1 650 000	190 700	11.6%
2022	1 610 000	267 200	

(a) Calculate the percentage of new cars sold that were electric cars in 2022.

Percentage = ... % **[1]**

(b) The total number of new cars sold in the UK has decreased over time from 2018 to 2022.

(i) Calculate the percentage decrease in new car sales from 2018 to 2022

Percentage decrease = ... % **[2]**

(ii) A scientist has made a prediction from the data in the table that, in 2039, all new cars sold in the UK will be electric cars.

Explain the reasons for this prediction, including any assumptions you have made.

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.....**[3]**

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This is an example of a question where Mathematical skills are expected to be applied to a unique context. This question is PO2. One mark is given for being able to demonstrate the skill of calculating a percentage. This question is referenced against M0.3 of Appendix D: Mathematical skills for Applied Science.

Students have been provided with the prediction, rather than being asked to make a prediction, to ensure that the focus of the question can be on the skill of how predictions are made and to ensure the mark scheme can remain manageable.

This is an example of a PO2 question. Students are expected to look at the data provided in Table 1 and make a suitable judgment as to what the most appropriate graphical form is for this data set. The mark scheme will allow any suitable type of graph for the mark to be awarded, but the expectation on students is to state compound bar chart or line graph.

(iii) Identify the most appropriate graphical form for the data in Table 1.

.....

..... **[1]**

(iv) State **one** advantage and **one** disadvantage of representing the data in this way.

Advantage .....

.....

Disadvantage .....

.....

[2]

Appendix B in the specification contains a glossary of Command Words which could be used in this exam. The glossary tells you what we mean by each command word.

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This is the stimulus material provided to students to help them answer the question on the next page. It will be kept as short as possible and will not contain superfluous information.
As part of our accessibility work, this information and the question will be on facing pages to prevent students from having to constantly move between pages.

7 John needs a new car and is investigating whether to buy an electric car.

John lives in a rural area.

John drives 10 000 miles a year. On average people in the UK drive 7 400 miles per year.

The table shows information about average-size electric, petrol and diesel cars.

Criteria	**Average-size car**		
	Electric car	**Petrol car**	**Diesel car**
Cost to buy new	£40 000	£26 000	£30 000
Ownership costs over 3-year period (Running, maintenance, insurance)	£13 000	£18 000	£16 000
Cost per 10 000 miles	£398	£1 500	£1 125
% Efficiency	80%	20%	25%
Time taken to refill / recharge	12 hours at home (30 minutes - fast charge station)	5 minutes	5 minutes
Filling /charging stations	Very few Uneven distribution around country	Many Distributed evenly around country	Many Distributed evenly around country
How many miles on a full tank / charge	250	400	400
Carbon Dioxide (CO_2) emissions	No CO_2	High CO_2	Low CO_2
Noise	Very quiet	Noisy	Very noisy

Discuss how beneficial an electric car would be for John.

In your answer you **must** write about:

- any **benefits** of an electric car
- any **disadvantages** of an electric car
- **how beneficial overall** an electric car would be for John **and** the reasons why.

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Students are told how their answer should be structured, while still allowing them to fully demonstrate the extent of their knowledge and understanding and their ability to write in extended form.

Students are expected to use the stimulus material provided in the question to help them.

Question 7 is an example of a 6-mark discuss question.

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11

.....

.....

.....

.....

..... **[6]**

END OF QUESTION PAPER

Tells students there are no more questions to answer.

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